PATENT ABSTRACTS OF JAPAN

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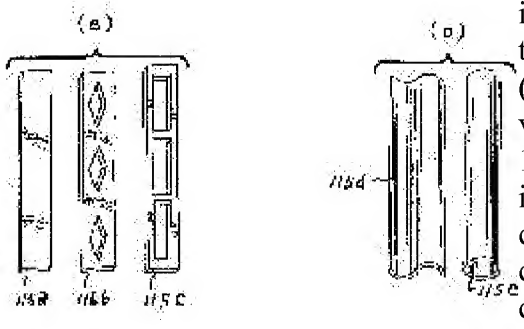
(54) **INK VESSEL**



(57)Abstract:

PROBLEM TO BE SOLVED: To provide an user with an early stage warning so as to make it possible to replace an ink vessel suitably.

SOLUTION: A collapsible ink vessel 1140 to store an ink supplying source, an outside vessel 1102 to surround the collapsible ink vessel 1140, and insert members 115 (115a to 115e) which are arranged in the collapsible ink vessel 1140 in order to give the collapsible ink vessel 1140 a function to oppose a collapse of the collapsible ink vessel 1140 are provided individually, and a characteristics between a pressure of the above collapsible ink vessel and a residual ink volume is controlled by an opposition against the above collapse.

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CLAIMS

[Claim(s)]
[Claim 1] (a) Ink tub of ****** which holds the source of supply of ink (b) Outside container which encloses the ink tub of said ****** (c) In order to give the function to oppose crushing of the ink tub of said ****** to the ink tub of said ****** The ink container which is equipped with the insertion member arranged in the ink tub of said ******, respectively, and is characterized by controlling the property between the pressure of the ink tub of said ******, and an ink residue by confrontation to said crushing.
[Claim 2] The ink container according to claim 1 characterized by said insertion member being an obedient member.
[Claim 3] The ink container according to claim 1 characterized by said insertion member being an un-obedient member.
[Claim 4] The ink container according to claim 1 characterized by said insertion member being foam.
[Claim 5] The ink container according to claim 4 characterized by said foam being polyurethane foam.
[Claim 6] The ink container according to claim 1 characterized by said insertion member consisting of a Motonari Mitsugi form sheet.
[Claim 7] Said insertion member is an ink container according to claim 1 characterized by determining the ink residue at the time of said pressure beginning to change.
[Claim 8] Said pressure is an ink container according to claim 1 characterized by beginning to change with more ink residues than the ink residue from which said pressure begins to change when the ink tub of said ****** does not have said insertion member.
[Claim 9] The ink container according to claim 1 characterized by having further the pressure transducer which is arranged inside said outside container and detects the pressure of the source of supply of said ink.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the exchangeable ink container containing the accumulation pressure sensor (integrated pressure sensor) which offers the signal used in order to detect ink level especially about the ink jet printing system using the exchangeable consumables containing an ink cartridge. Moreover, this invention relates to improvement in the pressure type

ink level detection which used the pressure controlling element in the ink back.
[0002]
[Description of the Prior Art] The technique of ink jet printing is developed good in comparison. Commercial products, such as a computer printer, a graphics plotter, and a facsimile device, are carried out based on the ink jet technique for producing the printed medium. Generally, an ink jet image is formed by arranging the ink droplet breathed out from the ink droplet generation equipment known as an ink jet print head to the exact arrangement on print media. Usually, an ink jet print head is supported on the movable carriage which crosses the front-face top of print media, and is controlled to spout an ink droplet according to the command of a microcomputer or other control units at the suitable time. It has the intention of the timing of application of this ink droplet corresponding to the pixel (pixel) pattern of the image currently printed.
[0003] The thing using the ink container which can separate separately from a print head and can be exchanged is in a well-known printer. If an ink container becomes empty, it will be removed from a print head and will be exchanged for a new ink container. By use of an exchangeable ink container separate from a print head, a user can exchange an ink container, without exchanging print heads. And when, as for exchange of a print head, the life of a print head is exhausted, or when it is carried out at the time and exchanged in an ink container, exchange of a print head is not performed.
[0004]
[Problem(s) to be Solved by the Invention] Generally predicting the ink piece condition of an ink container is not considered as a print head in the ink jet printing system which uses a separate ink container. In this ink jet printing system, when an ink container leaves little ink and becomes empty mostly, it is important to stop printing. If ink injection actuation is performed in the condition that there is no ink when that is not right, without breakage arising in a print head and creating/or a perfect printing image, a printer will operate and time amount will be wasted. Such printing will make especially time amount useless in printing of printing of a big image which is printed by the expensive medium by uninhabited in the state of uninhabited in many cases.
[0005]
[Means for Solving the Problem] This invention is turned to the ink container which has been arranged at the ink tub of ****** and which is crushed and contains the insertion member for control (collapse controlling insert) in order to make the ink tub (collapsible ink reservoir) of ****** for holding an ink source of supply, and the ink tub of this ****** oppose crushing of an ink tub under a deformable condition.
[0006]
[Embodiment of the Invention] About the advantage and the description of this invention which are indicated, if it reads and advances with an accompanying drawing, I will be easily understood by this contractor from the following detailed explanation.
[0007] The same element is expressed with the same reference mark in the following detailed explanation and some detailed drawings.
[0008] Drawing 1 shows the outline block diagram of the printer / plotter 50 which can apply this invention. The scan (print) carriage 52 holds two or more print cartridges 60, 62, 64, and 66 ****(ed) by the ink supply station 100 which supplies pressurization ink to the print cartridges 60-66. For example, each of the print cartridges 60-66 is equipped with an ink jet print head and accumulation print head memory, and it consists of typical examples of the print cartridge 60 including ink jet print head 60A and accumulation print head memory 60B so that it may be roughly illustrated by drawing 2 . Each print cartridges 60-66 have the fluid regulator valve, and

maintain the negative gage pressure optimal for the print head engine performance within a cartridge slightly by making these open and close. The ink supplied to each of the print cartridges 60-66 is pressurized in order to reduce the effect of a dynamic pressure drop.
[0009] The ink supply station 100 has held the receptacle or bay for receiving the ink container 110,112,114,116 which corresponds to the print cartridges 60-66 according to individual, respectively, and is ****(ed). Each of the ink containers 110-114 contains the ink tub of ******, for example, ink tub 110of ****** surrounded by pneumatic pressure room 110B A, (ink storage tank which can be contracted). The source of air pressure supply or a pump 70 flows with a pneumatic pressure room, and pressurizes ink tub 110A of ******. For example, one force pump 70 supplies pressurization air to all the ink containers 110-116 of the system concerned. The pressurized ink is distributed to a print cartridge through the ink passage containing flexible plastic tubing according to individual connected with the ink containers 110-116 among the print cartridges 60-66 which correspond, respectively.
[0010] Drawing 3 is a schematic diagram explaining the source 70 of air pressure supply, and a pneumatic line 72. It functions as distributing a pressurization gas to pressure room 110B, and pressure room 110B pressurizing ink tub 110A of ******, and distributing ink to a print head cartridge through the ink supply line 74, as for a pneumatic line 72. In order to detect the differential pressure between the air which is pressurizing ink tub 110A of ******, and the pressure showing the pressure of ink tub 110A of ******, the pressure transducer (transducer) 71 is formed. For example, this pressure transducer 71 has flowed with the ink supply line 74 and the pneumatic line 72. Replacing with this, a pressure transducer 71 is formed in pressure room 110B so that it may be illustrated by drawing 11 - drawing 15 , and it detects the ink pressure of ink tub 110A of ******, and the pressure of pressure room 110B. In still more nearly another alternative example, a pressure transducer 71 is an absolute-pressure sensor which detects the absolute pressure of the ink of the ink supply line 74 or ink tub 110A of ******.
[0011] Each of the ink containers 110-116 is equipped with the ink tub of ******, the one apparatus ink cartridge memory of an option, and the insertion member for crushing state control arranged at the ink tub of above-mentioned ******, and it is constituted so that the ink tub of ****** may be prevented by said insertion member under a deformable condition in the crushing (contraction or folding). In the typical example of the ink container 110, as roughly shown in drawing 4 , the ink container 110 is constituted including ink tub 110A, one apparatus ink cartridge memory 110D, pressure-transducer 110C of an option, and the insertion member 115 for crushing state control.
[0012] If drawing 1 is referred to succeedingly, the scan type print cartridge 52, the print cartridges 60-66, and the ink containers 110-114 interconnect electrically, respectively in the printer microprocessor controller (printer control unit) 80 which has the printer electronic equipment and firmware which control various kinds of printer ability. This printer control device 80 includes the analog-to-digital-conversion circuit for changing the output of the pressure transducer 71 for ink level detection arranged in relation to the ink containers 110-116. In this way, pudding TOHETSU of a scan carriage drive system and print carriage is controlled by the function of the printer control device 80, and a print head is energized alternatively, and it is constituted so that an ink droplet may be injected under a control state in connection with this at print media 40. Furthermore, the printer control unit 80 detects the ink residue of a low in each of the ink containers 110-114 according to the output of the related pressure transducer 71.
[0013] The host processor 82 containing CPU82A and software printer driver 82B is connected to the printer control unit 82. A host processor 82 is the personal computer of the exterior of a

printer 50. A monitor 84 is connected to a host processor 82, and this monitor 84 is used in order to display the various messages showing the condition of an ink jet printer. Or a printer 50 may consist of a stand-alone or network actuation, and a message is displayed on the front panel of a printer in this case.

[0014] Drawing 5 is illustrating roughly the 1 formal example of the large-sized printer / plotter which can apply this invention. In drawing 5 , the ink container 110,112,114,116 separated from the scan carriage 52 is installed in the ink supply station 100, and is illustrated. The printer / plotter 50 shown in drawing 5 include further housing 54, the front control panel 56 which offers the control switch for users, and the medium output slot 58. It should be understood that the printer / plotter 50 of this example may be replaced with this, and may use a sheet delivery device although print media is sent from a medium roll.

[0015] Next, reference of drawing 6 - drawing 9 , drawing 10 (a), drawing 10 (b) and drawing 11 - drawing 15 shows the example of the ink container 200 which adopted the insertion member 115 for crushing state control concerning this invention in each drawing. This ink container 200 is equipped with the insertion member 115 deformed so that crushing of the ink tub of ****** may be resisted. In addition, the example of this ink container 200 is an example which can be carried out to each of the almost same ink containers 110-116 on the ink container 200 and structure.

[0016] As shown in drawing 6 - drawing 7 , the ink container 200 is constituted including the chassis member 1120 generally attached in neck field 1102A in the front end section of an external container or a pressurized container 1102, and this pressurized container (outside container) 1102, the front end cap 1104 attached in the front end of a pressurized container 1102, and the back end cap 1106 attached in the back end of a pressurized container 1102.

[0017] The ink container 200 contains further the ink back or the ink tub 1140 of ****** so that it may be illustrated more by the detail in drawing 8 , drawing 9 , and drawing 11 . This ink tub 1140 is arranged in the internal room 1103 formed with the pressurized container 1102, and the keel section 1292 of a chassis 1120 is equipped in the state of the seal, and the inlet 1108 inside a pressurized container 1102 and the ink exhaust port 1110 of the ink held in the ink tub 114 are formed further, carrying out the seal of the interior of a pressurized container 1102 from the open air by this. It is crushed in the ink tub 1140 of ******, the insertion member 115 for inhibition or crushing control is formed, and he is trying to control the property between the differential pressure of an ink distribution system, and ink level by this insertion member 115 according to this invention.

[0018] More, when the tank wall of the ****** of the ink tub 1140 changes into the condition of having been pushed to the insertion member 115, if the insertion member 115 for crushing control is possible, it closes opposing crushing (contraction) of the ink tub 114 of ****** under a deformable condition in a detail. The insertion member 115 prepared in the ink tub 1140 of ****** and this acts effectively like the spring which bears the external pressure of the ink tub 1140 of ****** deformable.

[0019] While the ink tub 1140 of ****** is having the crushing prevented, the differential pressure between the pressure of the exterior of the ink tub 1140 of ****** and the pressure inside the ink tub 1140 of ****** begins to increase on larger ink residue level than the ink residue level which differential pressure begins to increase, when the insertion member 115 is not formed. If it puts in another way, the insertion member 115 for crushing inhibition will build the property between the ink supply pressure of the ink tub 1140 of ******, and an ink residue so that it may be certainly detected on ink residue level with a larger ink residue than the level

detected certainly [when the insertion member 115 is not formed]. Thus, ink residue level is certainly detected at an early stage in an ink supply life, and it is detected before it becomes so low that ink supply is fatal that an ink supply condition is in a low by this.
[0020] The insertion member 115 is good also as an un-obedient element to which it closes that the ink tub 1140 of ****** opposes in the deformable condition to an external pressure if , when you may make it constitute from an obedient element which deforms when the ink tub 1140 of ****** is crushed, or the ink tub 1140 of ****** is crushed and it is adapted to the configuration of the insertion member 115. When the ink tub 1140 of ****** is crushed against the obedient insertion member 115, the back of ****** may also be made to deform based on the deformans of the insertion member 115 which consists of an obedient element.
[0021] In the example of illustration, the insertion member 115 for crushing control is foaming panel 115a, foaming panel 115b which has the clipping section of a diamond configuration, or foaming panel 115c which has the rectangular clipping section, and these are all illustrated by drawing 10 (a). Moreover, these can be made into the thing made from polyurethane. By the existence of the clipping section prepared in these panels, ink makes easy more perfect discharge from the ink tub 1140 of ******.
[0022] ****** with the insertion member 115 obedient in the example of still more nearly another illustration for crushing control -- it is member 115of 115d [of wave-like members which are illustrated by the obedient Motonari Mitsugi form sheet (b), for example, drawing 10 ,], and C typeface e. An obedient Motonari Mitsugi form sheet acts like a solid spring, and, on the other hand, the rigidity of the ink tub 1140 of ****** opposes under a deformable condition to the external pressure of the ink tub 1140 of ****** with an un-obedient Motonari Mitsugi form sheet. A Motonari Mitsugi form sheet is good also as products made from plastics, such as polyethylene or polypropylene, or very good also as a product made from stainless steel of a thin film, for example.
[0023] The chassis member 1120 is fixed to opening of neck field 1102A of a pressurized container 1102 with the annular sticking-by-pressure ring 1280 which fits into the upper flange of a pressurized container 1102, and the contact flange of the chassis member 1120. Pressure seal O ring 1152 inserted in suitable for the perimeter slot of the chassis member 1120 engages with the inner surface of neck field 1102A of a pressurized container 1102.
[0024] The ink tub 1140 of ****** equips the detail with the back of the letter of a pleat who has an opposite wall or side faces 1114 and 1116 more. In one example of a configuration, the long form sheet which consists of a back ingredient is folded up so that it may join, and forms a long form cylinder so that the edge where this sheet counters may lap. The closure of the longitudinal direction edge of each other is carried out, and a pleat (rib) aligns mostly with the seal of a longitudinal direction edge in this obtained configuration. It is formed by heat sealing the structure of the letter of a pleat along with the joint crossed to the seal of a longitudinal direction edge, the back's pars basilaris ossis occipitalis, i.e., non-supplying edge. Although formed similarly, the upper part, i.e., the supply edge, of the ink tub 1140, the back leaves opening by which closure wearing is carried out to the keel section 1292 of the chassis member 1120. As a concrete example, closure wearing of the ink storage back is carried out by carrying out heat stake (heat caulking) at the keel section 1292.
[0025] The ink tub 1140 of ****** is carried out in this way, and demarcates occupancy partial 1103a of the internal room 1103, and non-occupying partial 1103b of the internal room 1103 is formed between a pressurized container 1102 and the ink tub 1140 of ******. An inlet 1108 is mere passage which frequents non-occupying partial 1103b which functions as a pneumatic

pressure room, and constitutes more fluid conveyance tubing which carries out a fluid flow with non-occupying partial 1103b of the internal room 1103 in a detail. The ink exhaust port 1110 is mere passage which frequents occupancy partial 1103a, and constitutes the interior of occupancy partial 1103a1140 of the internal room 1103, i.e., the ink tub of ******, and fluid conveyance tubing which ****. Preferably, the ink exhaust port 1110 is united with the keel section 1292 of the chassis member 1120.

[0026] As drawing 11 - drawing 15 show to a detail, a pressure transducer 71 is formed in the internal room 1103, and can detect the absolute pressure of the ink of the difference (namely, differential pressure) of the pressure of the pressure of non-occupying partial 1103b of the internal room 1103, and the pressure of the ink of the ink tub 1140 of ******, or the ink tub 1140 of ******. In the example of illustration, a pressure transducer 71 is mounted in a ceramic substrate 73, and forms the transducer subassembly attached in the paries lateralis orbitae of an output port 1110. It lets the hole or opening prepared in the hole prepared in the wall of this output port 1110 or opening, and a substrate 73 pass, and a pressure transducer 71 is put to the pressure of an output port 1110. In order to abolish the leakage between the inside of an output port 1110, and non-occupying partial 1103b of the internal room 1103, suitable sealing containing O ring 75 is prepared. The ink source of supply of the ink tub 1140 of ****** is approached very much, it is arranged, and, thereby, a pressure transducer 71 is efficiently put to the pressure in the ink tub 1140 of ****** so that a pressure transducer 71 may avoid the dynamic loss between an ink source of supply and a pressure survey point.

[0027] The electric generating power of a pressure transducer 71 is supplied to the exterior established in the upper part of the chassis member 1120 through the conductive lead wire 83 of the flexible printed circuit substrate 85 which extends between a ceramic substrate 73 and the upper part of a chassis 1120 in the accessible contact pad 81. In addition, the flexible printed circuit substrate 85 passes through between the outside front face of the chassis member 1120, and O rings 1152, and is arranged on the outside front face of the chassis member 1120. Electrical connection of the conductive lead wire 83 is carried out to the contact pad 81 accessible to the exterior arranged on the top face of the chassis member 1120. This contact pad 81 may be formed in the end of the flexible printed circuit substrate 85 attached in the top face of the chassis member 1120. The output of a pressure transducer 71 can be sampled during printing, and can avoid the need that this interrupts printing for the read of an output.

[0028] As an option, the memory chip package 87 can be suitably mounted on a ceramic substrate 73. This memory chip package 87 interconnects in the contact pad 81 accessible to the exterior relevant to this through the conductive lead wire 83 with which the flexible printed circuit substrate 85 is related.

[0029] In case low ink level (condition to which ink level became low) is detected, if drawing 16 and drawing 17 are referred to, about control of the property between the pressure offered by use of the insertion member 115 for crushing control, and the remaining amounts of ink, you can understand in a detail more. Drawing 16 shows the characteristic curve 102 showing the outline of the property between the characteristic curve 101 showing the outline of the property between the ink supply differential pressure about a system and the ink residues which employ the ink back of ****** who has an obedient foaming insertion member for crushing control concerning this invention, and the ink supply differential pressure about a system and the ink residue which employ the ink back of ****** who does not have an obedient foaming insertion member although it is the same or the same, respectively. Show characteristic curve [expressing the outline of the property between the ink supply differential-pressure force about a system /

employing the ink back of ****** / not having the insertion member of a wave / that rigidity is although drawing 17 is / the same or / the same as that of characteristic curve / expressing the outline of the property between the ink supply differential pressure about a system / employing the ink back of ****** / having the insertion member of a wave / that rigidity / starting this invention / is /, and an ink residue / 101 a /, and an ink residue] 102 a respectively.
[0030] The pressure (for example, pressure detected through an ink supply line) of ink supply is still almost equal to the pressure of a pressurization (for example, it can set to pressure line) gas in most life periods of an ink source of supply, and, for this reason, differential pressure is about 0 in most life periods of an ink source of supply. If an ink source of supply becomes close to the state of the sky, the pressure of an ink source of supply decreases, an ink residue decreases, and while ink decreases in number, thereby, differential pressure will increase. By use of the insertion member 115, ink source-of-supply differential pressure begins to increase on larger ink residue level than the level which begins to increase when the insertion member 115 does not have ink source-of-supply differential pressure. It is possible to detect the low ink level condition which approached when not as low as the ink residue was still fatal using this, and it is possible to give a user early warning which enables proper exchange of an ink container subsequently using this. If less than the low ink level threshold which requires ink level so that it may be shown by the differential-pressure force signal which the insertion member 115 enables it to perform positive detection of ink level at an early stage in the life period of an ink source of supply, and an ink level range with a selectable low ink level threshold is increased by this, and exceeds the selected pressure threshold and increases, if it puts in another way, low ink level warning will be given. For example, if it is chosen so that low ink level may become at an early stage more in the life period of an ink source of supply, a user will exchange an ink container, after printing an additional output. It is possible for rational coordination to have the relation between differential pressure and an ink residue also in which given system, and to consider as the reliable description, and the insertion member 115 is constituted so that initiation of a reliable pressure signal may be chosen.
[0031] If the insertion member 115 is less than the selected supply-pressure threshold as which control of the property between the ink supply pressures and ink residues which will decrease if a supply pressure begins to change is effectively brought about, and a supply pressure expresses a low ink level threshold and it falls, it should be understood that low ink level warning is given. The insertion member 115 increases an ink level range with a selectable low ink level bell threshold, and if ink level as shown with the supply pressure which is less than the supply-pressure threshold as which the differential-pressure force signal was chosen, and decreases is less than a low ink level threshold and it falls, low ink level warning will be given.
[0032] It is as follows when the above is summarized. The ink container (outside container 1102) has the ink tub 1140 of ****** containing an ink source of supply. And in order to control the property between the remaining ink source of supply (ink residue) about the ink tub 1140 of ******, and an ink supply pressure, the insertion members 115a-115e for crushing control are arranged at the ink tub 1140 of ******. Moreover, the ink level detection system containing the pressure transducer 71 for detecting the pressure of the ink source of supply showing the remaining amounts of ink is formed.
[0033] In the system by which only not a pressure with a larger ink source of supply than atmospheric pressure but ambient pressure or atmospheric pressure is presented with an ink source of supply, for example, a system into which the ink source of supply which is not pressurized goes up, and ink flows out of an ink container with gravity, although the above-

mentioned example is impressing the thing more than an external pressure (ambient pressure) to an ink source of supply, this invention can apply it. Moreover, indicated this invention is applicable also in other printings or the mark system which uses liquid ink, such as a fluid type electrical-and-electric-equipment photoprint system.
[0034] As mentioned above, although specific explanation and illustration of an operation gestalt of this invention were performed, the modifications and examples of modification of various kinds of do by this contractor, without deviating from the range and pneuma of this invention which are defined by the claim.

TECHNICAL FIELD

[Field of the Invention] This invention relates to the exchangeable ink container containing the accumulation pressure sensor (integrated pressure sensor) which offers the signal used in order to detect ink level especially about the ink jet printing system using the exchangeable consumables containing an ink cartridge. Moreover, this invention relates to improvement in the pressure type ink level detection which used the pressure controlling element in the ink back.

PRIOR ART

[Description of the Prior Art] The technique of ink jet printing is developed good in comparison. Commercial products, such as a computer printer, a graphics plotter, and a facsimile device, are carried out based on the ink jet technique for producing the printed medium. Generally, an ink jet image is formed by arranging the ink droplet breathed out from the ink droplet generation equipment known as an ink jet print head to the exact arrangement on print media. Usually, an ink jet print head is supported on the movable carriage which crosses the front-face top of print media, and is controlled to spout an ink droplet according to the command of a microcomputer or other control units at the suitable time. It has the intention of the timing of application of this ink droplet corresponding to the pixel (pixel) pattern of the image currently printed.
[0003] The thing using the ink container which can separate separately from a print head and can be exchanged is in a well-known printer. If an ink container becomes empty, it will be removed from a print head and will be exchanged for a new ink container. By use of an exchangeable ink container separate from a print head, a user can exchange an ink container, without exchanging print heads. And when, as for exchange of a print head, the life of a print head is exhausted, or when it is carried out at the time and exchanged in an ink container, exchange of a print head is not performed.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Generally predicting the ink piece condition of an ink container is not considered as a print head in the ink jet printing system which uses a separate ink container. In this ink jet printing system, when an ink container leaves little ink and becomes empty mostly, it is important to stop printing. If ink injection actuation is performed in the

condition that there is no ink when that is not right, without breakage arising in a print head and creating/or a perfect printing image, a printer will operate and time amount will be wasted. Such printing will make especially time amount useless in printing of printing of a big image which is printed by the expensive medium by uninhabited in the state of uninhabited in many cases.

MEANS

[Means for Solving the Problem] This invention is turned to the ink container which has been arranged at the ink tub of ****** and which is crushed and contains the insertion member for control (collapse controlling insert) in order to make the ink tub (collapsible ink reservoir) of ****** for holding an ink source of supply, and the ink tub of this ****** oppose crushing of an ink tub under a deformable condition.

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[0007] The same element is expressed with the same reference mark in the following detailed explanation and some detailed drawings.

[0008] Drawing 1 shows the outline block diagram of the printer / plotter 50 which can apply this invention. The scan (print) carriage 52 holds two or more print cartridges 60, 62, 64, and 66 ****(ed) by the ink supply station 100 which supplies pressurization ink to the print cartridges 60-66. For example, each of the print cartridges 60-66 is equipped with an ink jet print head and accumulation print head memory, and it consists of typical examples of the print cartridge 60 including ink jet print head 60A and accumulation print head memory 60B so that it may be roughly illustrated by drawing 2 . Each print cartridges 60-66 have the fluid regulator valve, and maintain the negative gage pressure optimal for the print head engine performance within a cartridge slightly by making these open and close. The ink supplied to each of the print cartridges 60-66 is pressurized in order to reduce the effect of a dynamic pressure drop.

[0009] The ink supply station 100 has held the receptacle or bay for receiving the ink container 110,112,114,116 which corresponds to the print cartridges 60-66 according to individual, respectively, and is ****(ed). Each of the ink containers 110-114 contains the ink tub of ******, for example, ink tub 110of ****** surrounded by pneumatic pressure room 110B A, (ink storage tank which can be contracted). The source of air pressure supply or a pump 70 flows with a pneumatic pressure room, and pressurizes ink tub 110A of ******. For example, one force pump 70 supplies pressurization air to all the ink containers 110-116 of the system concerned. The pressurized ink is distributed to a print cartridge through the ink passage containing flexible plastic tubing according to individual connected with the ink containers 110-116 among the print cartridges 60-66 which correspond, respectively.

[0010] Drawing 3 is a schematic diagram explaining the source 70 of air pressure supply, and a pneumatic line 72. It functions as distributing a pressurization gas to pressure room 110B, and pressure room 110B pressurizing ink tub 110A of ******, and distributing ink to a print head cartridge through the ink supply line 74, as for a pneumatic line 72. In order to detect the differential pressure between the air which is pressurizing ink tub 110A of ******, and the pressure showing the pressure of ink tub 110A of ******, the pressure transducer (transducer) 71 is formed. For example, this pressure transducer 71 has flowed with the ink supply line 74

and the pneumatic line 72. Replacing with this, a pressure transducer 71 is formed in pressure room 110B so that it may be illustrated by drawing 11 - drawing 15 , and it detects the ink pressure of ink tub 110A of ******, and the pressure of pressure room 110B. In still more nearly another alternative example, a pressure transducer 71 is an absolute-pressure sensor which detects the absolute pressure of the ink of the ink supply line 74 or ink tub 110A of ******.
[0011] Each of the ink containers 110-116 is equipped with the ink tub of ******, the one apparatus ink cartridge memory of an option, and the insertion member for crushing state control arranged at the ink tub of above-mentioned ******, and it is constituted so that the ink tub of ****** may be prevented by said insertion member under a deformable condition in the crushing (contraction or folding). In the typical example of the ink container 110, as roughly shown in drawing 4 , the ink container 110 is constituted including ink tub 110A, one apparatus ink cartridge memory 110D, pressure-transducer 110C of an option, and the insertion member 115 for crushing state control.
[0012] If drawing 1 is referred to succeedingly, the scan type print cartridge 52, the print cartridges 60-66, and the ink containers 110-114 interconnect electrically, respectively in the printer microprocessor controller (printer control unit) 80 which has the printer electronic equipment and firmware which control various kinds of printer ability. This printer control device 80 includes the analog-to-digital-conversion circuit for changing the output of the pressure transducer 71 for ink level detection arranged in relation to the ink containers 110-116. In this way, pudding TOHETSU of a scan carriage drive system and print carriage is controlled by the function of the printer control device 80, and a print head is energized alternatively, and it is constituted so that an ink droplet may be injected under a control state in connection with this at print media 40. Furthermore, the printer control unit 80 detects the ink residue of a low in each of the ink containers 110-114 according to the output of the related pressure transducer 71.
[0013] The host processor 82 containing CPU82A and software printer driver 82B is connected to the printer control unit 82. A host processor 82 is the personal computer of the exterior of a printer 50. A monitor 84 is connected to a host processor 82, and this monitor 84 is used in order to display the various messages showing the condition of an ink jet printer. Or a printer 50 may consist of a stand-alone or network actuation, and a message is displayed on the front panel of a printer in this case.
[0014] Drawing 5 is illustrating roughly the 1 formal example of the large-sized printer / plotter which can apply this invention. In drawing 5 , the ink container 110,112,114,116 separated from the scan carriage 52 is installed in the ink supply station 100, and is illustrated. The printer / plotter 50 shown in drawing 5 include further housing 54, the front control panel 56 which offers the control switch for users, and the medium output slot 58. It should be understood that the printer / plotter 50 of this example may be replaced with this, and may use a sheet delivery device although print media is sent from a medium roll.
[0015] Next, reference of drawing 6 - drawing 9 , drawing 10 (a), drawing 10 (b) and drawing 11 - drawing 15 shows the example of the ink container 200 which adopted the insertion member 115 for crushing state control concerning this invention in each drawing. This ink container 200 is equipped with the insertion member 115 deformed so that crushing of the ink tub of ****** may be resisted. In addition, the example of this ink container 200 is an example which can be carried out to each of the almost same ink containers 110-116 on the ink container 200 and structure.
[0016] As shown in drawing 6 - drawing 7 , the ink container 200 is constituted including the chassis member 1120 generally attached in neck field 1102A in the front end section of an

external container or a pressurized container 1102, and this pressurized container (outside container) 1102, the front end cap 1104 attached in the front end of a pressurized container 1102, and the back end cap 1106 attached in the back end of a pressurized container 1102.
[0017] The ink container 200 contains further the ink back or the ink tub 1140 of ****** so that it may be illustrated more by the detail in drawing 8 , drawing 9 , and drawing 11 . This ink tub 1140 is arranged in the internal room 1103 formed with the pressurized container 1102, and the keel section 1292 of a chassis 1120 is equipped in the state of the seal, and the inlet 1108 inside a pressurized container 1102 and the ink exhaust port 1110 of the ink held in the ink tub 114 are formed further, carrying out the seal of the interior of a pressurized container 1102 from the open air by this. It is crushed in the ink tub 1140 of ******, the insertion member 115 for inhibition or crushing control is formed, and he is trying to control the property between the differential pressure of an ink distribution system, and ink level by this insertion member 115 according to this invention.
[0018] More, when the tank wall of the ****** of the ink tub 1140 changes into the condition of having been pushed to the insertion member 115, if the insertion member 115 for crushing control is possible, it closes opposing crushing (contraction) of the ink tub 114 of ****** under a deformable condition in a detail. The insertion member 115 prepared in the ink tub 1140 of ****** and this acts effectively like the spring which bears the external pressure of the ink tub 1140 of ****** deformable.
[0019] While the ink tub 1140 of ****** is having the crushing prevented, the differential pressure between the pressure of the exterior of the ink tub 1140 of ****** and the pressure inside the ink tub 1140 of ****** begins to increase on larger ink residue level than the ink residue level which differential pressure begins to increase, when the insertion member 115 is not formed. If it puts in another way, the insertion member 115 for crushing inhibition will build the property between the ink supply pressure of the ink tub 1140 of ******, and an ink residue so that it may be certainly detected on ink residue level with a larger ink residue than the level detected certainly [when the insertion member 115 is not formed]. Thus, ink residue level is certainly detected at an early stage in an ink supply life, and it is detected before it becomes so low that ink supply is fatal that an ink supply condition is in a low by this.
[0020] The insertion member 115 is good also as an un-obedient element to which it closes that the ink tub 1140 of ****** opposes in the deformable condition to an external pressure if , when you may make it constitute from an obedient element which deforms when the ink tub 1140 of ****** is crushed, or the ink tub 1140 of ****** is crushed and it is adapted to the configuration of the insertion member 115. When the ink tub 1140 of ****** is crushed against the obedient insertion member 115, the back of ****** may also be made to deform based on the deformans of the insertion member 115 which consists of an obedient element.
[0021] In the example of illustration, the insertion member 115 for crushing control is foaming panel 115a, foaming panel 115b which has the clipping section of a diamond configuration, or foaming panel 115c which has the rectangular clipping section, and these are all illustrated by drawing 10 (a). Moreover, these can be made into the thing made from polyurethane. By the existence of the clipping section prepared in these panels, ink makes easy more perfect discharge from the ink tub 1140 of ******.
[0022] ****** with the insertion member 115 obedient in the example of still more nearly another illustration for crushing control -- it is member 115of 115d [of wave-like members which are illustrated by the obedient Motonari Mitsugi form sheet (b), for example, drawing 10 ,], and C typeface e. An obedient Motonari Mitsugi form sheet acts like a solid spring, and, on the

other hand, the rigidity of the ink tub 1140 of ****** opposes under a deformable condition to the external pressure of the ink tub 1140 of ****** with an un-obedient Motonari Mitsugi form sheet. A Motonari Mitsugi form sheet is good also as products made from plastics, such as polyethylene or polypropylene, or very good also as a product made from stainless steel of a thin film, for example.

[0023] The chassis member 1120 is fixed to opening of neck field 1102A of a pressurized container 1102 with the annular sticking-by-pressure ring 1280 which fits into the upper flange of a pressurized container 1102, and the contact flange of the chassis member 1120. Pressure seal O ring 1152 inserted in suitable for the perimeter slot of the chassis member 1120 engages with the inner surface of neck field 1102A of a pressurized container 1102.

[0024] The ink tub 1140 of ****** equips the detail with the back of the letter of a pleat who has an opposite wall or side faces 1114 and 1116 more. In one example of a configuration, the long form sheet which consists of a back ingredient is folded up so that it may join, and forms a long form cylinder so that the edge where this sheet counters may lap. The closure of the longitudinal direction edge of each other is carried out, and a pleat (rib) aligns mostly with the seal of a longitudinal direction edge in this obtained configuration. It is formed by heat sealing the structure of the letter of a pleat along with the joint crossed to the seal of a longitudinal direction edge, the back's pars basilaris ossis occipitalis, i.e., non-supplying edge. Although formed similarly, the upper part, i.e., the supply edge, of the ink tub 1140, the back leaves opening by which closure wearing is carried out to the keel section 1292 of the chassis member 1120. As a concrete example, closure wearing of the ink storage back is carried out by carrying out heat stake (heat caulking) at the keel section 1292.

[0025] The ink tub 1140 of ****** is carried out in this way, and demarcates occupancy partial 1103a of the internal room 1103, and non-occupying partial 1103b of the internal room 1103 is formed between a pressurized container 1102 and the ink tub 1140 of ******. An inlet 1108 is mere passage which frequents non-occupying partial 1103b which functions as a pneumatic pressure room, and constitutes more fluid conveyance tubing which carries out a fluid flow with non-occupying partial 1103b of the internal room 1103 in a detail. The ink exhaust port 1110 is mere passage which frequents occupancy partial 1103a, and constitutes the interior of occupancy partial 1103a1140 of the internal room 1103, i.e., the ink tub of ******, and fluid conveyance tubing which ****. Preferably, the ink exhaust port 1110 is united with the keel section 1292 of the chassis member 1120.

[0026] As drawing 11 - drawing 15 show to a detail, a pressure transducer 71 is formed in the internal room 1103, and can detect the absolute pressure of the ink of the difference (namely, differential pressure) of the pressure of the pressure of non-occupying partial 1103b of the internal room 1103, and the pressure of the ink of the ink tub 1140 of ******, or the ink tub 1140 of ******. In the example of illustration, a pressure transducer 71 is mounted in a ceramic substrate 73, and forms the transducer subassembly attached in the paries lateralis orbitae of an output port 1110. It lets the hole or opening prepared in the hole prepared in the wall of this output port 1110 or opening, and a substrate 73 pass, and a pressure transducer 71 is put to the pressure of an output port 1110. In order to abolish the leakage between the inside of an output port 1110, and non-occupying partial 1103b of the internal room 1103, suitable sealing containing O ring 75 is prepared. The ink source of supply of the ink tub 1140 of ****** is approached very much, it is arranged, and, thereby, a pressure transducer 71 is efficiently put to the pressure in the ink tub 1140 of ****** so that a pressure transducer 71 may avoid the dynamic loss between an ink source of supply and a pressure survey point.

[0027] The electric generating power of a pressure transducer 71 is supplied to the exterior established in the upper part of the chassis member 1120 through the conductive lead wire 83 of the flexible printed circuit substrate 85 which extends between a ceramic substrate 73 and the upper part of a chassis 1120 in the accessible contact pad 81. In addition, the flexible printed circuit substrate 85 passes through between the outside front face of the chassis member 1120, and O rings 1152, and is arranged on the outside front face of the chassis member 1120. Electrical connection of the conductive lead wire 83 is carried out to the contact pad 81 accessible to the exterior arranged on the top face of the chassis member 1120. This contact pad 81 may be formed in the end of the flexible printed circuit substrate 85 attached in the top face of the chassis member 1120. The output of a pressure transducer 71 can be sampled during printing, and can avoid the need that this interrupts printing for the read of an output.
[0028] As an option, the memory chip package 87 can be suitably mounted on a ceramic substrate 73. This memory chip package 87 interconnects in the contact pad 81 accessible to the exterior relevant to this through the conductive lead wire 83 with which the flexible printed circuit substrate 85 is related.
[0029] In case low ink level (condition to which ink level became low) is detected, if drawing 16 and drawing 17 are referred to, about control of the property between the pressure offered by use of the insertion member 115 for crushing control, and the remaining amounts of ink, you can understand in a detail more. Drawing 16 shows the characteristic curve 102 showing the outline of the property between the characteristic curve 101 showing the outline of the property between the ink supply differential pressure about a system and the ink residues which employ the ink back of ****** who has an obedient foaming insertion member for crushing control concerning this invention, and the ink supply differential pressure about a system and the ink residue which employ the ink back of ****** who does not have an obedient foaming insertion member although it is the same or the same, respectively. Show characteristic curve [expressing the outline of the property between the ink supply differential-pressure force about a system / employing the ink back of ****** / not having the insertion member of a wave / that rigidity is although drawing 17 is / the same or / the same as that of characteristic curve / expressing the outline of the property between the ink supply differential pressure about a system / employing the ink back of ****** / having the insertion member of a wave / that rigidity / starting this invention / is /, and an ink residue / 101 a /, and an ink residue] 102 a respectively.
[0030] The pressure (for example, pressure detected through an ink supply line) of ink supply is still almost equal to the pressure of a pressurization (for example, it can set to pressure line) gas in most life periods of an ink source of supply, and, for this reason, differential pressure is about 0 in most life periods of an ink source of supply. If an ink source of supply becomes close to the state of the sky, the pressure of an ink source of supply decreases, an ink residue decreases, and while ink decreases in number, thereby, differential pressure will increase. By use of the insertion member 115, ink source-of-supply differential pressure begins to increase on larger ink residue level than the level which begins to increase when the insertion member 115 does not have ink source-of-supply differential pressure. It is possible to detect the low ink level condition which approached when not as low as the ink residue was still fatal using this, and it is possible to give a user early warning which enables proper exchange of an ink container subsequently using this. If less than the low ink level threshold which requires ink level so that it may be shown by the differential-pressure force signal which the insertion member 115 enables it to perform positive detection of ink level at an early stage in the life period of an ink source of supply, and an ink level range with a selectable low ink level threshold is increased by this, and

exceeds the selected pressure threshold and increases, if it puts in another way, low ink level warning will be given. For example, if it is chosen so that low ink level may become at an early stage more in the life period of an ink source of supply, a user will exchange an ink container, after printing an additional output. It is possible for rational coordination to have the relation between differential pressure and an ink residue also in which given system, and to consider as the reliable description, and the insertion member 115 is constituted so that initiation of a reliable pressure signal may be chosen.

[0031] If the insertion member 115 is less than the selected supply-pressure threshold as which control of the property between the ink supply pressures and ink residues which will decrease if a supply pressure begins to change is effectively brought about, and a supply pressure expresses a low ink level threshold and it falls, it should be understood that low ink level warning is given. The insertion member 115 increases an ink level range with a selectable low ink level bell threshold, and if ink level as shown with the supply pressure which is less than the supply-pressure threshold as which the differential-pressure force signal was chosen, and decreases is less than a low ink level threshold and it falls, low ink level warning will be given.

[0032] It is as follows when the above is summarized. The ink container (outside container 1102) has the ink tub 1140 of ****** containing an ink source of supply. And in order to control the property between the remaining ink source of supply (ink residue) about the ink tub 1140 of ******, and an ink supply pressure, the insertion members 115a-115e for crushing control are arranged at the ink tub 1140 of ******. Moreover, the ink level detection system containing the pressure transducer 71 for detecting the pressure of the ink source of supply showing the remaining amounts of ink is formed.

[0033] In the system by which only not a pressure with a larger ink source of supply than atmospheric pressure but ambient pressure or atmospheric pressure is presented with an ink source of supply, for example, a system into which the ink source of supply which is not pressurized goes up, and ink flows out of an ink container with gravity, although the above-mentioned example is impressing the thing more than an external pressure (ambient pressure) to an ink source of supply, this invention can apply it. Moreover, indicated this invention is applicable also in other printings or the mark system which uses liquid ink, such as a fluid type electrical-and-electric-equipment photoprint system.

[0034] As mentioned above, although specific explanation and illustration of an operation gestalt of this invention were performed, the modifications and examples of modification of various kinds of do by this contractor, without deviating from the range and pneuma of this invention which are defined by the claim.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the outline block diagram of the printer / plotter system which can apply the ink level detecting circuit concerning this invention.

[Drawing 2] It is the outline block diagram showing the major components about one of the print cartridge of the printer / plotter system of drawing 1 .

[Drawing 3] It is the outline block diagram showing briefly connection with the ink container separated from the carriage of the printer / plotter system of drawing 1 , the source of air pressure supply, and the print cartridge carried in carriage.

[Drawing 4] It is the outline block diagram showing the major components about one of the ink containers of the printer / plotter system of drawing 1 .
[Drawing 5] It is the perspective view showing one example of the printer / plotter system of drawing 1 .
[Drawing 6] It is the decomposition perspective view showing the major components about one example [one] of the ink container of the printer / plotter system of drawing 1 .
[Drawing 7] It is the further decomposition perspective view showing the main component about one example [one] of the ink container of the printer / plotter system of drawing 1 .
[Drawing 8] They are the pressurized container of drawing 6 and the ink container of drawing 7 , the ink tub of ******, and the decomposition perspective view showing a chassis member.
[Drawing 9] It is the decomposition perspective view showing the ink tub and chassis member of ****** of drawing 6 and drawing 7 . [of an ink container]
[Drawing 10] The perspective view in which drawing 10 (a) shows roughly the example of the insertion member of drawing 6 and the ink container of drawing 7 , and drawing 10 (b) are the perspective views showing roughly the further example of the insertion member of drawing 6 and the ink container of drawing 7 .
[Drawing 11] It is drawing 6 and the ink container of drawing 7 , and is the sectional view of the ink container with which it has a pressure transducer.
[Drawing 12] It is the sectional view showing the wearing condition of the pressure transducer to the chassis member of drawing 6 and the ink container of drawing 7 .
[Drawing 13] It is the perspective view showing the electric contact (contact pad) arranged in the top face of the chassis member of drawing 6 and the ink container of drawing 7 .
[Drawing 14] It is the perspective view showing the wearing condition of the pressure transducer to the chassis member of drawing 6 and the ink container of drawing 7 .
[Drawing 15] It is the decomposition perspective view showing the chassis member of a pressure transducer, drawing 6 , and the ink container of drawing 7 .
[Drawing 16] It is the graph which shows the characteristic curve about the property between the differential pressure and the ink residues which are obtained by the system which adopted the ink tub of ****** which does not have an obedient insertion member identically to the characteristic curve about the property between the differential pressure and the ink residues which are obtained by the system which adopted the ink tub of ****** which has an obedient insertion member concerning this invention, or similarly.
[Drawing 17] It is the graph which shows the characteristic curve about the property between the differential pressure and the ink residues which are obtained by the system which adopted the ink tub of ****** which does not have the insertion member which is not flexible identically to the characteristic curve about the property between the differential pressure and the ink residues which are obtained by the system which adopted the ink tub of ****** which has the insertion member concerning this invention which is not flexible, or similarly.
[Description of Notations]
1140 Ink Tub of ******
1102 Outside Container
115 Insertion Member
115a-115e Insertion member
71 Pressure Transducer

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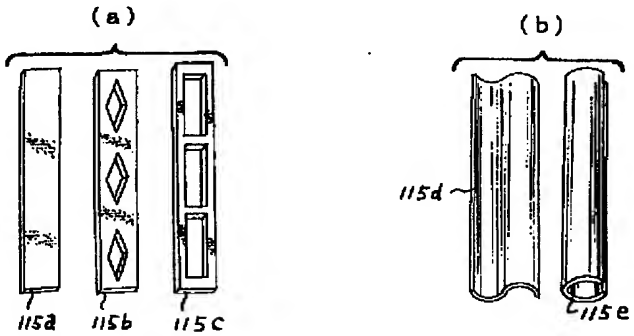
最終頁に続く

(54)【発明の名称】　インク容器

(57)【要約】
【課題】　インク容器の適宜な交換を可能にする早期の警告をユーザに与えることを可能にする。
【解決手段】　インクの供給源を収容する可潰性のインク槽１１４０と、可潰性のインク槽１１４０を取り囲む外側容器１１０２と、可潰性のインク槽１１４０に可潰性のインク槽１１４０の潰れに対抗する機能を持たせるために、可潰性のインク槽１１４０に配設されるインサート部材１１５（１１５ａ～１１５ｅ）とをそれぞれ備え、前記潰れに対する対抗により、前記可潰性のインク槽の圧力とインク残量との間の特性を制御する。



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【特許請求の範囲】
【請求項１】（ａ）　インクの供給源を収容する可潰性のインク槽と、（ｂ）　前記可潰性のインク槽を取り囲む外側容器と、（ｃ）　前記可潰性のインク槽に前記可潰性のインク槽の潰れに対抗する機能を持たせるために、前記可潰性のインク槽に配設されるインサート部材と、をそれぞれ備え、
前記潰れに対する対抗により、前記可潰性のインク槽の圧力とインク残量との間の特性を制御すること、を特徴とするインク容器。
【請求項２】　前記インサート部材が従順な部材であることを特徴とする請求項１に記載のインク容器。
【請求項３】　前記インサート部材が非従順な部材であることを特徴とする請求項１に記載のインク容器。
【請求項４】　前記インサート部材が発泡体であることを特徴とする請求項１に記載のインク容器。
【請求項５】　前記発泡体がポリウレタン発泡体であることを特徴とする請求項４に記載のインク容器。
【請求項６】　前記インサート部材が三次元成形シートから成ることを特徴とする請求項１に記載のインク容器。
【請求項７】　前記インサート部材は、前記圧力が変化し始める際のインク残量を決定することを特徴とする請求項１に記載のインク容器。
【請求項８】　前記圧力は、前記可潰性のインク槽が前記インサート部材を有しない場合に前記圧力が変化し始めるインク残量よりも多いインク残量で変化し始めることを特徴とする請求項１に記載のインク容器。
【請求項９】　前記外側容器の内側に配設され、前記インクの供給源の圧力を検知する圧力変換器をさらに備えることを特徴とする請求項１に記載のインク容器。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、インクカートリッジを含む交換可能な消耗部品を用いたインクジェット印刷システムに関し、特に、インクレベルを検出するために用いられる信号を提供する集積圧力センサ（統合圧力センサ）を含む交換可能なインク容器に関する。また、本発明は、インクバック内の圧力制御素子を用いた圧力式インクレベル検知の向上に関するものである。
【０００２】
【従来の技術】インクジェット印刷の技術は、比較的に良好に開発されている。コンピュータプリンタ、グラフィックスプロッタ、ファクシミリ機器等の市販製品が、印刷された媒体を生産するためのインクジェット技術に基づいて実施されている。一般に、インクジェット画像は、インクジェットプリントヘッドとして知られるインク滴生成装置から吐出されるインク滴を、印刷媒体上の正確な配置に配置することによって形成される。通常、インクジェットプリントヘッドは、印刷媒体の表面上を

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横切る可動キャリッジ上に支持され、マイクロコンピュータ又はその他の制御装置のコマンドに従って適当な時にインク滴を噴出するように制御される。このインク滴の適用のタイミングは、印刷されている画像の画素（ピクセル）パターンに対応することが意図されている。
【０００３】周知のプリンタの中には、プリントヘッドとは別個に分離して交換することができるインク容器を利用するものがある。インク容器は、空になると、プリントヘッドから取り外して新しいインク容器と交換される。プリントヘッドとは別個の交換可能なインク容器の使用により、ユーザは、プリントヘッドを交換することなくインク容器を交換することができる。そして、プリントヘッドの交換は、プリントヘッドの寿命が尽きたとき、或いはその頃に行われ、インク容器が交換されるときにはプリントヘッドの交換は行われない。
【０００４】
【発明が解決しようとする課題】プリントヘッドとは別個のインク容器を使用するインクジェット印刷システムでは、一般に、インク容器のインク切れ状態を予測することが考慮されていない。かかるインクジェット印刷システムにおいて、インク容器が少量のインクを残してほぼ空になった場合には印刷を中止することが重要である。そうでない場合には、インクが無い状態でインク噴射動作を行なうと、プリントヘッドに破損が生じる可能性があり、かつ／又は、完全な印刷画像を作成することなくプリンタが動作して時間が浪費されてしまうこととなる。このような印刷は、無人状態で高価な媒体に無人で印刷されることが多いような大きな画像の印刷の印刷において、特に時間を無駄にしてしまう。
【０００５】
【課題を解決するための手段】本発明は、インク供給源を収容するための可潰性のインク槽（collapsible ink reservoir）と、この可潰性のインク槽を変形可能な状態の下でインク槽の潰れに対抗せしめるために可潰性のインク槽に配置された潰れ制御用のインサート部材（collapse controlling insert）とを含むインク容器に向けられている。
【０００６】
【発明の実施の形態】開示される本発明の利点及び特徴については、添付図面とともに読み進めれば以下の詳細な説明から当業者には容易に理解されよう。
【０００７】以下の詳細な説明及びいくつかの図面において、同様の要素は同一の参照符号で表わされている。
【０００８】図１は、本発明を適用することができるプリンタ／プロッタ５０の概略ブロック図を示している。走査（プリント）キャリッジ５２は、プリントカートリッジ６０～６６に加圧インクを供給するインク供給ステーション１００に液通される複数個のプリントカートリッジ６０，６２，６４，６６を保持している。例えば、プリントカートリッジ６０～６６の各々は、インクジェ

ットプリントヘッドと、集積プリントヘッドメモリとを備えており、図２に概略的に図示されるように、プリントカートリッジ６０の典型的な例では、インクジェットプリントヘッド６０Ａと集積プリントヘッドメモリ６０Ｂとを含んで構成されている。各プリントカートリッジ６０～６６は、流体調整弁を有しており、これらを開閉させることにより、プリントヘッド性能にとって最適な僅かに負のゲージ圧をカートリッジ内で維持するようになっている。プリントカートリッジ６０～６６のそれぞれに供給されるインクは、動的圧力滴の影響を低減するために加圧されるようになっている。

【０００９】インク供給ステーション１００は、個別のプリントカートリッジ６０～６６にそれぞれ対応しかつ液通されるインク容器１１０，１１２，１１４，１１６を受けるためのレセプタクル又はベイを収容している。インク容器１１０～１１４の各々は、可潰性のインク槽、例えば、空気圧室１１０Ｂにより囲まれる可潰性のインク槽１１０Ａ（収縮可能なインク貯蔵槽）を含んでいる。空気圧供給源若しくはポンプ７０は、空気圧室と導通し、可潰性のインク槽１１０Ａを加圧する。例えば、１個の圧力ポンプ７０は、加圧空気を当該システムの全てのインク容器１１０～１１６に供給する。加圧されたインクは、例えば、インク容器１１０～１１６と、それぞれ対応するプリントカートリッジ６０～６６の間に連結される個別のフレキシブルプラスチック管を含むインク流路を介してプリントカートリッジに分配されるようになっている。

【００１０】図３は、空気圧供給源７０及び空気圧ライン７２を説明する概略図である。空気圧ライン７２は、加圧気体を圧力室１１０Ｂに分配し、圧力室１１０Ｂは、可潰性のインク槽１１０Ａを加圧してインク供給ライン７４を介してインクをプリントヘッドカートリッジに分配するように機能する。可潰性のインク槽１１０Ａを加圧している空気と、可潰性のインク槽１１０Ａの圧力を表す圧力との間の圧力差を検出するために圧力変換器（トランスデューサ）７１が設けられている。例えば、この圧力変換器７１は、インク供給ライン７４及び空気圧ライン７２と導通している。これに代えて、圧力変換器７１は、図１１～図１５に図示されるように圧力室１１０Ｂ内に設けられ、可潰性のインク槽１１０Ａのインク圧力、及び圧力室１１０Ｂの圧力を検知する。さらに別の代替例においては、圧力変換器７１は、インク供給ライン７４又は可潰性のインク槽１１０Ａのインクの絶対圧力を検知する絶対圧力センサである。

【００１１】インク容器１１０～１１６の各々は、可潰性のインク槽と、オプションの一体型インクカートリッジメモリと、上述の可潰性のインク槽に配置された潰れ状態制御用のインサート部材とを備えており、前記インサート部材により、可潰性のインク槽がその潰れ（収縮若しくは折り畳み）を変形可能な状態の下で阻止され得るように構成されている。インク容器１１０の代表的な例においては、図４に概略的に示されるように、インク容器１１０は、インク槽１１０Ａと、一体型インクカートリッジメモリ１１０Ｄと、オプションの圧力変換器１１０Ｃと、潰れ状態制御用のインサート部材１１５とを含んで構成されている。

【００１２】引き続き図１を参照すると、走査式プリントカートリッジ５２，プリントカートリッジ６０～６６，及びインク容器１１０～１１４は、各種のプリンタ機能を制御するプリンタ電子機器及びファームウェアを有するプリンタマイクロプロセッサ制御装置（プリンタ制御装置）８０にそれぞれ電気的に相互接続されている。このプリンタ制御装置８０は、例えば、インク容器１１０～１１６に関連して配設されるインクレベル検知用圧力変換器７１の出力を変換するためのアナログ・ディジタル変換回路を含んでいる。かくして、プリンタ制御装置８０の機能によって、走査キャリッジドライブシステム及びプリントキャリッジのプリントヘッが制御されて、プリントヘッドが選択的に付勢され、これに伴ってインク滴が印刷媒体４０に制御状態の下で噴射されるように構成されている。さらに、プリンタ制御装置８０は、関連する圧力変換器７１の出力に応じてインク容器１１０～１１４のそれぞれにおいて低レベルのインク残量を検出する。

【００１３】ＣＰＵ８２Ａ及びソフトウェアプリンタドライバ８２Ｂを含むホストプロセッサ８２は、プリンタ制御装置８２に接続されている。ホストプロセッサ８２は、例えば、プリンタ５０の外部のパーソナルコンピュータである。ホストプロセッサ８２にはモニタ８４が接続され、このモニタ８４は、インクジェットプリンタの状態を表す各種メッセージを表示するために用いられる。或いは、プリンタ５０は、スタンドアロン又はネットワーク動作で構成されてもよく、この場合にはメッセージがプリンタのフロントパネルに表示される。

【００１４】図５は、本発明を適用することができる大型プリンタ／プロッタの一形式例を概略的に図示している。図５においては、走査キャリッジ５２から分離されたインク容器１１０，１１２，１１４，１１６が、インク供給ステーション１００に設置されて図示されている。図５に示されるプリンタ／プロッタ５０は、ハウジング５４と、ユーザ用の制御スイッチを提供するフロントコントロールパネル５６と、媒体出力スロット５８とをさらに含んでいる。この例のプリンタ／プロッタ５０は、印刷媒体が媒体ロールから送られるが、これに代えてシート送り機構を使用してもよいことは理解されるべきである。

【００１５】次に、図６～図９，図１０（ａ），図１０（ｂ），及び図１１～図１５を参照すると、各図には、本発明に係る潰れ状態制御用のインサート部材１１５を採用したインク容器２００の実施例が示されている。こ

のインク容器２００には、可潰性のインク槽の潰れに抗するように変形するインサート部材１１５が備えられている。なお、このインク容器２００の実施例は、インク容器２００と構造上ほぼ同一のインク容器１１０～１１６のそれぞれに対して実施可能な実施例である。

【００１６】図６～図７に示されるように、インク容器２００は、一般に、外部容器若しくは圧力容器１１０２と、この圧力容器（外側容器）１１０２の前端部にあるネック領域１１０２Ａに取付けられるシャシ部材１１２０と、圧力容器１１０２の前端に取付けられる前端キャップ１１０４と、圧力容器１１０２の後端に取付けられる後端キャップ１１０６とを含んで構成されている。

【００１７】図８，図９，及び図１１においてより詳細に図示されるように、インク容器２００は、可潰性のインクバック又はインク槽１１４０をさらに含んでいる。このインク槽１１４０は、圧力容器１１０２により画成された内部室１１０３内に配設され、かつ、シャシ１１２０のキール部１２９２にシール状態で装着されており、これによって圧力容器１１０２の内部を外気からシールしながら、圧力容器１１０２の内部への吸気口１１０８と、インク槽１１４に収容されるインクのインク排出口１１１０とがさらに設けられている。本発明によれば、可潰性のインク槽１１４０には潰れ阻止又は潰れ制御用のインサート部材１１５が設けられており、このインサート部材１１５によりインク分配システムの圧力差とインクレベルとの間の特性を制御するようにしている。

【００１８】より詳細には、潰れ制御用のインサート部材１１５は、インク槽１１４０の可潰性の槽壁がインサート部材１１５に対して押し付けられた状態になったときに、可潰性のインク槽１１４の潰れ（収縮）を変形可能な状態の下で対抗することを可能ならしめる。可潰性のインク槽１１４０及びこれに設けられたインサート部材１１５は、可潰性のインク槽１１４０の外部圧力に変形可能に耐えるバネのように効果的に作用する。

【００１９】可潰性のインク槽１１４０がその潰れを阻止されているときには、可潰性のインク槽１１４０の外部の圧力と可潰性のインク槽１１４０の内部の圧力との間の圧力差は、インサート部材１１５を設けていない場合に圧力差が増加し始めるインク残量レベルより大きいインク残量レベルで増加し始める。換言すれば、潰れ阻止用のインサート部材１１５は、インク残量が、インサート部材１１５を設けていない場合に確実に検出されるレベルよりも大きいインク残量レベルで確実に検出されるように、可潰性のインク槽１１４０のインク供給圧力とインク残量との間の特性を構築する。このように、インク残量レベルは、インク供給寿命において早期に確実に検出され、これによりインク供給状態が低レベルにあることは、インク供給が致命的なほど低くなる前に検出される。

【００２０】インサート部材１１５は、可潰性のインク槽１１４０が潰れるときに変形する従順な要素から構成するようにしてもよく、或いは、可潰性のインク槽１１４０が潰れてインサート部材１１５の形状に順応するときに可潰性のインク槽１１４０が外部圧力に対して変形可能な状態で対抗することを可能ならしめる非従順な要素としてもよい。従順な要素から成るインサート部材１１５の変形性に基づいて、可潰性のインク槽１１４０が従順なインサート部材１１５に対抗して潰れるときに可潰性のバックも変形するようにしてもよい。

【００２１】図示の例では、潰れ制御用のインサート部材１１５は、発泡パネル１１５ａ，ダイヤモンド形状の切抜き部を有する発泡パネル１１５ｂ，又は矩形の切抜き部を有する発泡パネル１１５ｃであり、これらは全て図１０（ａ）に図示されている。また、これらは、ポリウレタン製のものとすることができる。これらのパネルに設けられた切抜き部の存在により、インクは可潰性のインク槽１１４０からのより完全な排出を容易にする。

【００２２】さらに別の図示の例では、潰れ制御用のインサート部材１１５は、従順な又は非従順な三次元成形シート、例えば、図１０（ｂ）に図示されるような波形の部材１１５ｄ又はＣ字形の部材１１５ｅである。従順な三次元成形シートは、立体バネのように作用し、一方、非従順な三次元成形シートにより、可潰性のインク槽１１４０の剛性が可潰性のインク槽１１４０の外部圧力に対して変形可能な状態の下で対抗する。三次元成形シートは、ポリエチレン又はポリプロピレンなどのプラスチック製としてもよく、又は、例えば非常に薄膜のステンレススチール製としてもよい。

【００２３】シャシ部材１１２０は、圧力容器１１０２のネック領域１１０２Ａの開口部に、例えば、圧力容器１１０２の上部フランジ及びシャシ部材１１２０の当接フランジに嵌合する環状圧着リング１２８０によって固定される。シャシ部材１１２０の周囲溝に適切に嵌め込まれた圧力封止Ｏリング１１５２は、圧力容器１１０２のネック領域１１０２Ａの内部表面に係合される。

【００２４】可潰性のインク槽１１４０は、より詳細には、対向壁又は側面１１１４，１１１６を有するプリーツ状のバックを備えている。一つの構成例においては、バック材料からなる長形シートは、このシートの対向する端部が重なるように、又は接合するように折り畳まれ、長形シリンダを形成する。横方向端部は互いに封止され、プリーツ（ひだ）は、この得られた構成において横方向端部のシールとほぼ整列される。バックの底部すなわち非供給端部は、横方向端部のシールに対して横切る合わせ目に沿ってプリーツ状の構造をヒートシールすることによって形成される。インク槽１１４０の上部すなわち供給端部も同様に形成されるが、バックがシャシ部材１１２０のキール部１２９２に封止装着される開口を残しておく。具体的な例として、インク貯蔵バック

は、ヒート・ステーク（熱かしめ）することによってキール部１２９２に封止装着される。

【００２５】可潰性のインク槽１１４０は、このようにして内部室１１０３の占有部分１１０３ａを画定し、内部室１１０３の非占有部分１１０３ｂが圧力容器１１０２と可潰性のインク槽１１４０の間に形成される。吸気口１１０８は、空気圧室として機能する非占有部分１１０３ｂに出入りする単なる流路であり、より詳細には、内部室１１０３の非占有部分１１０３ｂと流体導通する流体搬送管を構成する。インク排出口１１１０は、占有部分１１０３ａに出入りする単なる流路であり、内部室１１０３の占有部分１１０３ａ、すなわち可潰性のインク槽１１４０の内部と液通する流体搬送管を構成する。好ましくは、インク排出口１１１０は、シャシ部材１１２０のキール部１２９２と一体化される。

【００２６】図１１～図１５により詳細に示すように、圧力変換器７１は、内部室１１０３に設けられ、内部室１１０３の非占有部分１１０３ｂの圧力と、可潰性のインク槽１１４０のインクの圧力との圧力の差（すなわち、圧力差）又は可潰性のインク槽１１４０のインクの絶対圧力を検出することができる。図示の例では、圧力変換器７１は、セラミック基板７３に実装されて、出力ポート１１１０の外側壁に取付けられる変換器サブアセンブリを形成する。この出力ポート１１１０の壁に設けられた孔又は開口、及び、基板７３に設けられた孔又は開口を通して、圧力変換器７１が出力ポート１１１０の圧力に曝される。出力ポート１１１０の内側と、内部室１１０３の非占有部分１１０３ｂとの間の漏れをなくすために、Ｏリング７５を含む適当なシーリングが設けられる。圧力変換器７１は、インク供給源と圧力測定点との間の動的損失を回避するように、可潰性のインク槽１１４０のインク供給源に非常に近接して配置され、これにより、圧力変換器７１が可潰性のインク槽１１４０内の圧力に効率良く曝される。

【００２７】圧力変換器７１の電気出力は、シャシ部材１１２０の上部に設けられた外部にアクセス可能な接触パッド８１に、セラミック基板７３とシャシ１１２０の上部との間に延在するフレキシブルプリント回路基板８５の導電性リード線８３を介して供給されるようになっている。なお、フレキシブルプリント回路基板８５は、シャシ部材１１２０の外側表面とＯリング１１５２との間を通過してシャシ部材１１２０の外側表面上に配置されている。導電性リード線８３は、シャシ部材１１２０の上面に配置される外部にアクセス可能な接触パッド８１と電気接続される。この接触パッド８１は、シャシ部材１１２０の上面に取付けられるフレキシブルプリント回路基板８５の一端に形成され得る。圧力変換器７１の出力は、印刷中にサンプリングすることが可能であり、これにより出力の読取りのために印刷を中断する必要を回避することが可能である。

【００２８】オプションとして、メモリチップパッケージ８７をセラミック基板７３上に適宜に実装可能である。このメモリチップパッケージ８７は、フレキシブルプリント回路基板８５の関連する導電性リード線８３を介して、これに関連する外部にアクセス可能な接触パッド８１に相互接続される。

【００２９】低インクレベル（インクレベルが低くなった状態）を検出する際、潰れ制御用のインサート部材１１５の使用により提供される圧力と残りのインク量との間の特性の制御については、図１６及び図１７を参照すればより詳細に理解が可能である。図１６は、本発明に係る潰れ制御用の従順な発泡インサート部材を有する可潰性のインクバックを採用するシステムについてのインク供給圧力差とインク残量との間の特性の概要を表す特性曲線１０１と、同一又は同様であるが、従順な発泡インサート部材を有さない可潰性のインクバックを採用するシステムについてのインク供給圧力差とインク残量との間の特性の概要を表す特性曲線１０２とをそれぞれ示している。図１７は、本発明に係る剛性のある波形のインサート部材を有する可潰性のインクバックを採用するシステムについてのインク供給圧力差とインク残量との間の特性の概要を表す特性曲線１０１ａと、同一又は同様であるが、剛性のある波形のインサート部材を有しない可潰性のインクバックを採用するシステムについてのインク供給差動圧力とインク残量との間の特性の概要を表す特性曲線１０２ａをそれぞれ示している。

【００３０】インク供給の圧力（例えば、インク供給ラインを介して検出される圧力）は、インク供給源の寿命期間の殆どにおいて（例えば、圧力ラインにおける）加圧気体の圧力とほぼ等しいままであり、このため、圧力差はインク供給源の寿命期間の殆どにおいてほぼ零である。インク供給源が空の状態に近くなると、インク供給源の圧力が減少してインク残量が減少し、これにより、インクが減少するとともに圧力差が増加する。インサート部材１１５の使用により、インク供給源圧力差が、インク供給源圧力差がインサート部材１１５のない場合に増加し始めるレベルより大きいインク残量レベルで増加し始める。このことを利用して、インク残量がまだ致命的なほど低くないときに差し迫った低インクレベル状態を検出することが可能であり、次いで、これを用いて、インク容器の適宜な交換を可能にする早期の警告をユーザに与えることが可能である。換言すれば、インサート部材１１５により、インク供給源の寿命期間において早期にインクレベルの確実な検出を行うことが可能になり、これにより、低インクレベルしきい値が選択可能なインクレベルレンジを増大させ、選択された圧力しきい値を上回って増大する差動圧力信号によって示されるように、インクレベルがかかる低インクレベルしきい値を下回ると低インクレベル警告が与えられる。例えば、低インクレベルがインク供給源の寿命期間においてより早

期になるように選択されると、ユーザは、追加出力をプリントした後、インク容器を交換する。圧力差とインク残量との関係は、何れの所与のシステムにおいても合理的な一貫性があり、信頼できる特徴とすることが可能であり、インサート部材１１５は、信頼性のある圧力信号の開始を選択するように構成される。

【００３１】インサート部材１１５は、供給圧力が変化し始めると減少するインク供給圧力とインク残量との間の特性の制御を効果的にもたらし、かつ、供給圧力が低インクレベルしきい値を表す選択された供給圧力しきい値を下回って低下すると、低インクレベル警告が与えられることが理解されるべきである。インサート部材１１５は、低インクレベルベルしきい値が選択可能なインクレベルレンジを増大し、差動圧力信号が選択された供給圧力しきい値を下回って減少する供給圧力によって示されるようなインクレベルが低インクレベルしきい値を下回って低下すると、低インクレベル警告が与えられる。

【００３２】以上を要約すると、次の通りである。インク容器（外側容器１１０２）は、インク供給源を含んだ可潰性のインク槽１１４０を有している。そして、可潰性のインク槽１１４０についての、残りのインク供給源（インク残量）とインク供給圧力との間の特性を制御するために、潰れ制御用のインサート部材１１５ａ～１１５ｅが可潰性のインク槽１１４０に配置されている。また、残りのインク量を表すインク供給源の圧力を検知するための圧力変換器７１を含むインクレベル検知システムが設けられている。

【００３３】上記の実施例は、外部圧力（周囲圧力）以上のものをインク供給源に印加しているが、本発明は、インク供給源が大気圧より大きい圧力ではなく、周囲圧力又は大気圧にのみインク供給源が供されるシステム、例えば、加圧されないインク供給源が上昇されてインクが重力によりインク容器から流れ出すようなシステムにおいて適用可能である。また、開示された本発明は、流体式電気写真印刷システムなどのインク液を使用する他の印刷又はマークシステムにおいても適用可能である。

【００３４】以上、本発明の特定の実施形態の説明及び図示を行ったが、その各種の変形例及び変更例が、特許請求の範囲により定義される本発明の範囲及び精神から逸脱することなく当業者によりなされ得る。

【図面の簡単な説明】

【図１】本発明に係るインクレベル検知回路を適用可能なプリンタ／プロッタ・システムの概略ブロック図である。

【図２】図１のプリンタ／プロッタ・システムのプリントカートリッジの１個についてその主要コンポーネントを示す概略ブロック図である。

【図３】図１のプリンタ／プロッタ・システムの、キャリッジから分離されたインク容器，空気圧供給源，及びキャリッジに搭載されたプリントカートリッジとの接続を簡単に示す概略ブロック図である。

【図４】図１のプリンタ／プロッタ・システムのインク容器の１個についてその主要コンポーネントを示す概略ブロック図である。

【図５】図１のプリンタ／プロッタ・システムの一実施例を示す斜視図である。

【図６】図１のプリンタ／プロッタ・システムのインク容器の１個の一実施例についてその主要コンポーネントを示す分解斜視図である。

【図７】図１のプリンタ／プロッタ・システムのインク容器の１個の一実施例についてその主要なコンポーネントを示すさらなる分解斜視図である。

【図８】図６及び図７のインク容器の圧力容器，可潰性のインク槽、及びシャシ部材を示す分解斜視図である。

【図９】図６及び図７のインク容器の可潰性のインク槽及びシャシ部材を示す分解斜視図である。

【図１０】図１０（ａ）は、図６及び図７のインク容器のインサート部材の例を概略的に示す斜視図、図１０（ｂ）は、図６及び図７のインク容器のインサート部材のさらなる例を概略的に示す斜視図である。

【図１１】図６及び図７のインク容器であって、圧力変換器が備えられるインク容器の断面図である。

【図１２】図６及び図７のインク容器のシャシ部材への圧力変換器の装着状態を示す断面図である。

【図１３】図６及び図７のインク容器のシャシ部材の上面に配設される電気接触子（接触パッド）を示す斜視図である。

【図１４】図６及び図７のインク容器のシャシ部材への圧力変換器の装着状態を示す斜視図である。

【図１５】圧力変換器及び図６及び図７のインク容器のシャシ部材を示す分解斜視図である。

【図１６】本発明に係る従順なインサート部材を有する可潰性のインク槽を採用したシステムにより得られる、圧力差とインク残量との間の特性についての特性曲線と、同一又は同様の、ただし従順なインサート部材を有しない可潰性のインク槽を採用したシステムにより得られる、圧力差とインク残量との間の特性についての特性曲線とを示すグラフである。

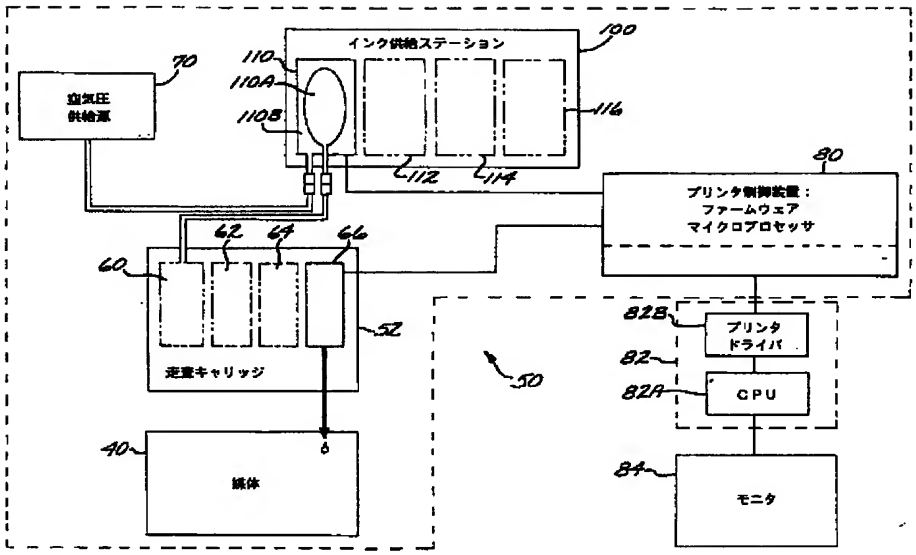
【図１７】本発明に係るフレキシブルでないインサート部材を有する可潰性のインク槽を採用したシステムにより得られる、圧力差とインク残量との間の特性についての特性曲線と、同一又は同様の、ただしフレキシブルでないインサート部材を有しない可潰性のインク槽を採用したシステムにより得られる、圧力差とインク残量との間の特性についての特性曲線とを示すグラフである。

【符号の説明】

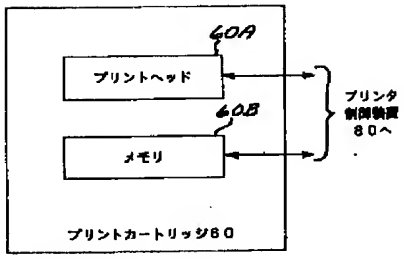
１１４０　　可潰性のインク槽
１１０２　　外側容器
１１５　インサート部材
１１５ａ～１１５ｅ　　インサート部材

７１　圧力変換器

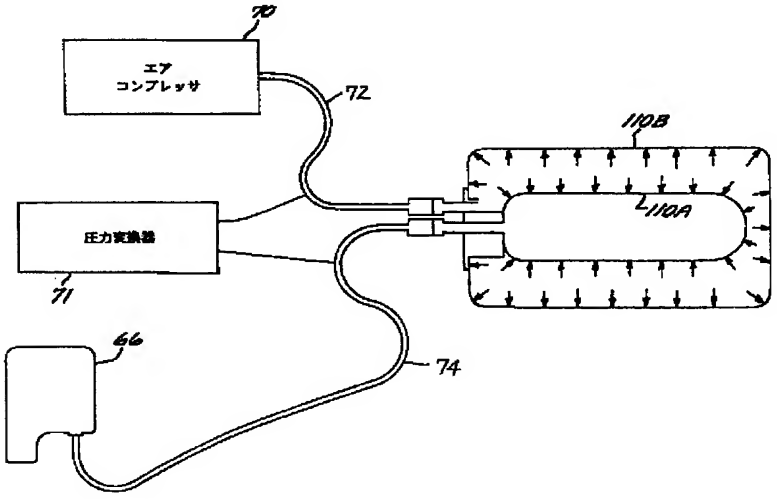
【図１】



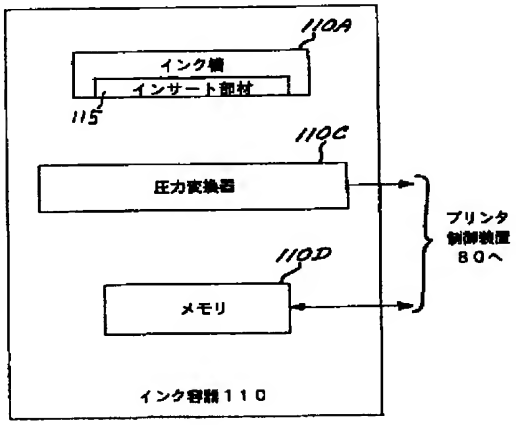
【図２】



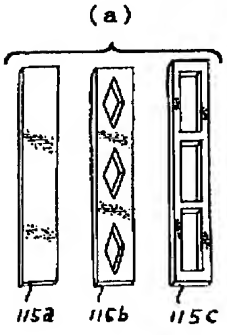
【図３】

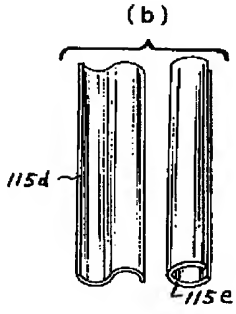


【図４】

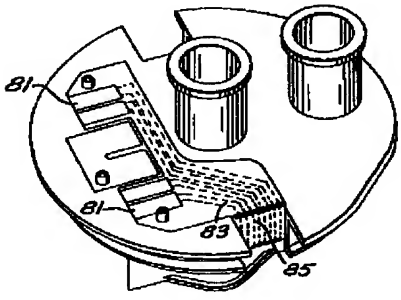


【図１０】

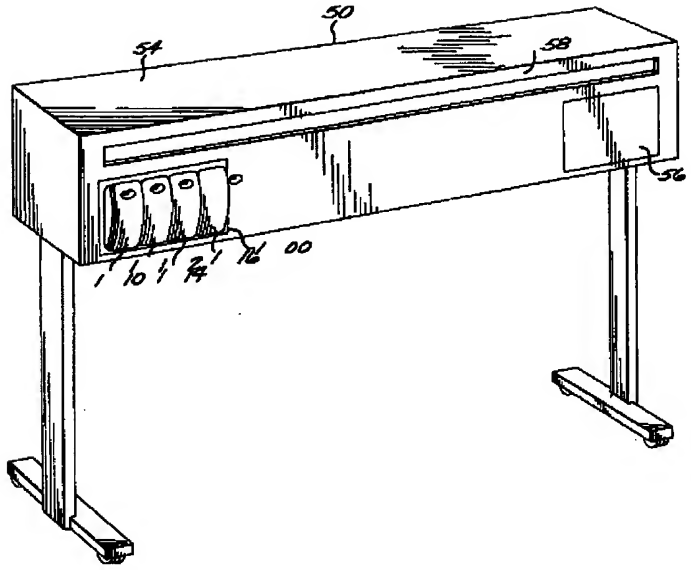




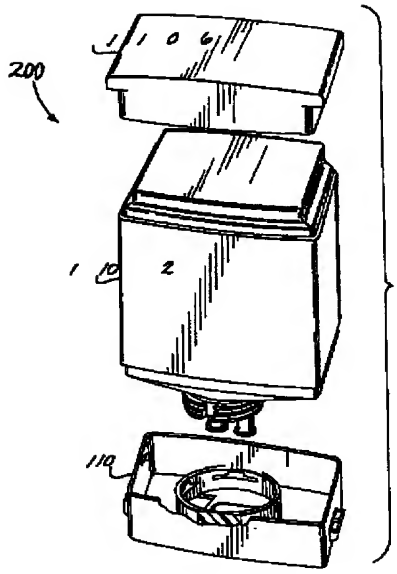
【図１３】



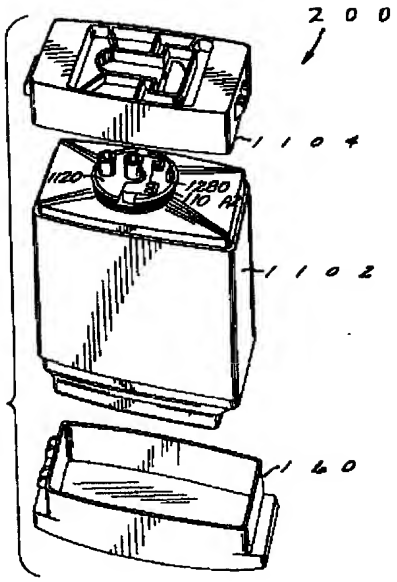
【図５】



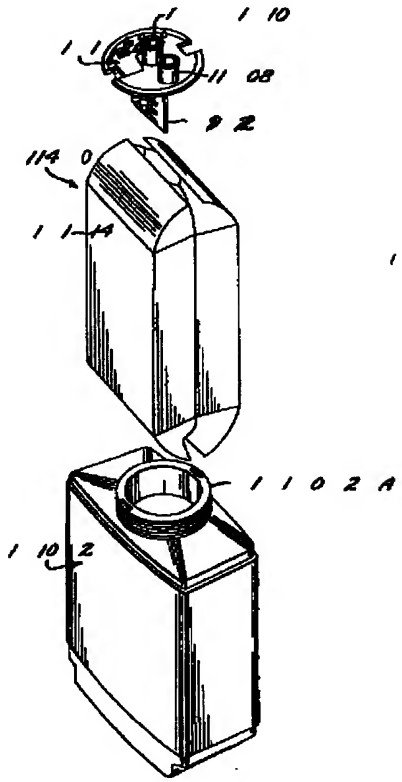
【図６】



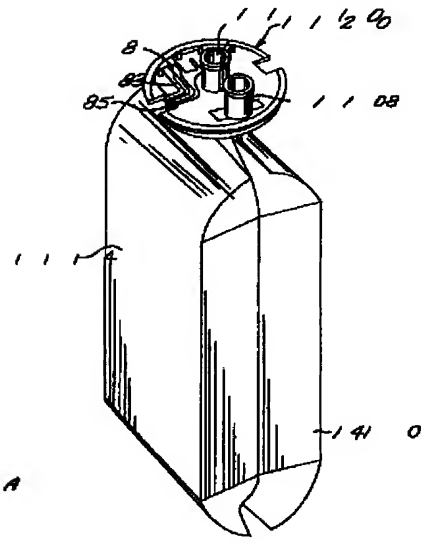
【図７】



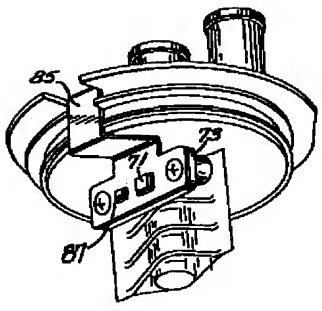
【図８】



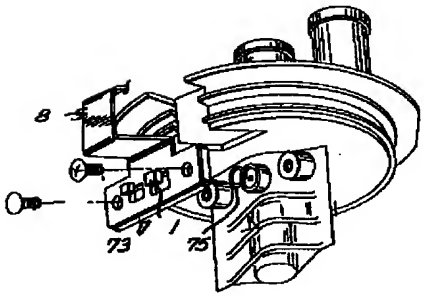
【図９】



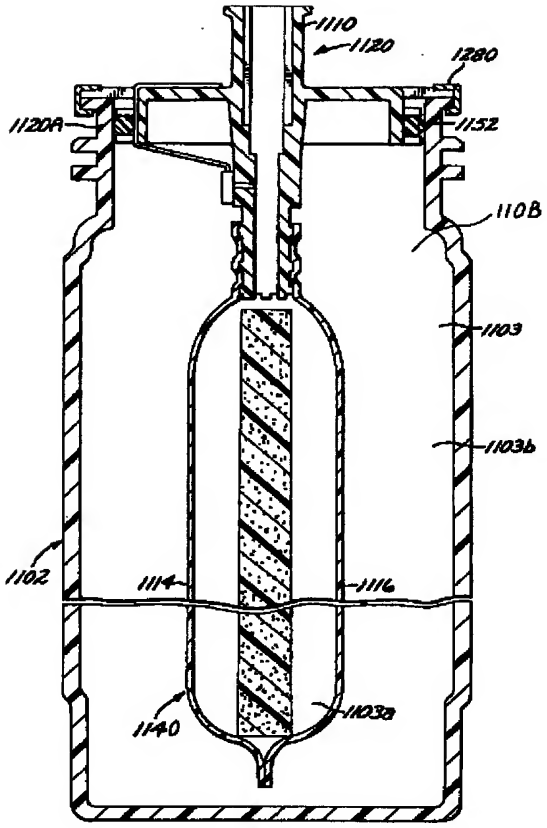
【図４】



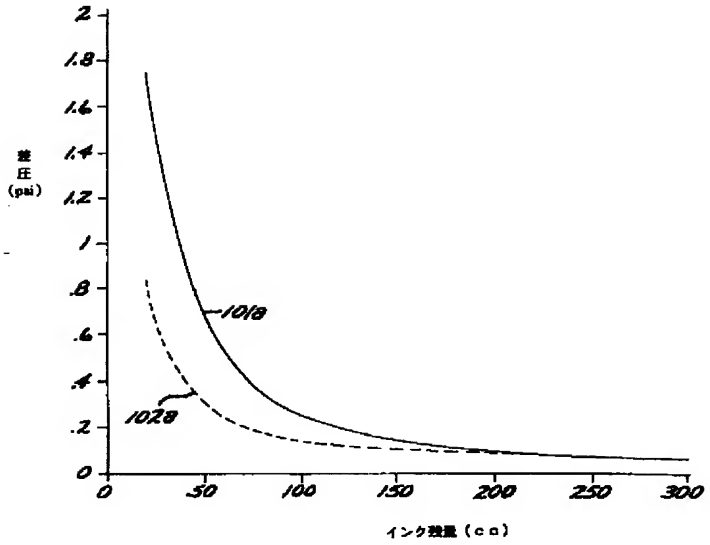
【図１５】



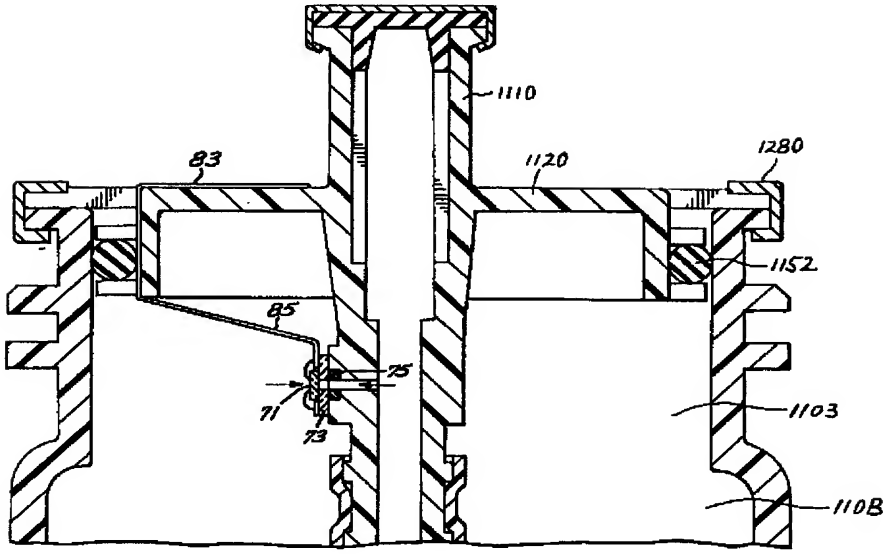
【図１１】


1110
1120
1280
1120A
1152
110B
1103
1103b
1102
1114
1116
1140
1103a

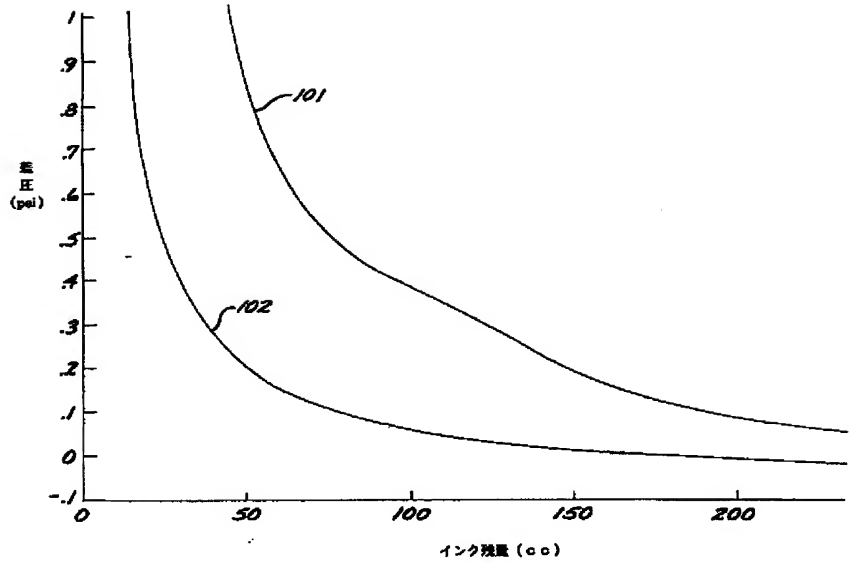
【図１７】


2
1.8
1.6
1.4
1.2
1
.8
.6
.4
.2
0
圧
(psi)
0
50
100
150
200
250
300
インク残量（ｃｃ）
1018
1028

【図１２】


1110
83
1120
1280
1152
85
75
71
73
1103
110B

【図１６】



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